

Notice of Allowability**Application No.**

10/538,534

Applicant(s)

FRASCH ET AL.

Examiner

AMANDA SHAW

Art Unit

1634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the papers filed 10/19/2010 and 11/18/2010.
2. ☒ The allowed claim(s) is/are 40,42-45 and 60.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
(b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 2/3/2011.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Amanda Shaw/
Examiner 1634

EXAMINER'S AMENDMENT

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 19, 2010 and November 18, 2010 has been entered.

Response to Amendment

2. The declarations under 37 CFR 1.132 filed on October 19, 2010 and November 18, 2010 have been fully considered. The rejections made under 35 USC 103 in sections 6-9 of the Office Action of May 12, 2010 are withdrawn in view of the declarations, Applicant's arguments, and the Examiner's Amendment (as shown below).

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with George Leone on February 3, 2011.

4. The specification (para 00014) has been amended as follows:

FIG. 1 illustrates a representation of the F1-ATPase enzyme;

FIGS. 2a-2d illustrate the various positions of the gold nanorod during one revolution of the gamma-subunit arm; FIG. 2a illustrates the gold nanorod is shown in position A; FIG. 2b illustrates the gold nanorod is shown in position B; FIG. 2c illustrates the gold nanorod is shown in position C; FIG. 2d illustrates the gold nanorod is shown in position D;

FIG. 3 is a dark field microscopy instrumentation setup used to detect the scattered light; and

FIG. 4 is another embodiment for detecting a target substance using rotation of the gold nanorods (SEQ ID NOS: 1 and 2).

5. The claims have been amended as follows:

Claims 1-39 (Cancelled)

Claim 40 (Currently Amended): A method of detecting motion in nanoscale structures, comprising:

providing a molecular motor having a rotating arm;

attaching a rod-shaped nanoparticle to the rotating arm of the molecular motor so that the nanoparticle rotates with the rotating arm of the molecular motor, wherein the nanoparticle is attached to the rotating arm of the molecular motor by a bridge formed in the presence of a DNA detection strand when hybridized to a target DNA strand,

wherein the nanoparticle has a first surface and a second surface, and wherein the first surface has greater area than the second surface;

exposing a light to the rod-shaped nanoparticle, wherein the nanoparticle scatters a first polarized wavelength of the light when the nanoparticle is in a first position and the nanoparticle scatters a second polarized wavelength of the light when the nanoparticle is in a second position;

filtering the first and second polarized wavelengths of the light through a polarizing filter to detect rotational motion by observing alternating first and second wavelengths of the light.

Claim 41 (Cancelled)

Claim 42 (Previously Presented): The method of Claim 40 wherein the rod-shaped nanoparticle is a gold nanorod.

Claim 43 (Previously presented): The method of Claim 42 wherein the first polarized wavelength of the light is longer than the second polarized wavelength of the light.

Claim 44 (Previously Presented): The method of Claim 43 wherein the first polarized wavelength of the light is red light and the second polarized wavelength of the light is green light.

Claim 45 (Previously Presented): The method of Claim 40 wherein the molecular motor is an F1-ATPase enzyme.

Claims 46-59 (Cancelled)

Claim 60 (Currently Amended): A method of detecting motion in nanoscale structures comprising:

providing a molecular motor having a rotatable arm;

attaching a nanoparticle having a first axis and a second axis to the rotatable arm of the molecular motor so that the nanoparticle rotates with the rotatable arm of the molecular motor, wherein the nanoparticle is attached to the rotatable arm of the molecular motor by a bridge formed in the presence of a DNA detection strand when hybridized to a target DNA strand, and wherein the first axis of the nanoparticle has a greater length than the second axis;

providing light from a fixed location;

altering a path of the light from the fixed location to create an oblique angle with respect to the first axis and second axis of the nanoparticle;

exposing the light from the altered path onto the nanoparticle, the first axis of the nanoparticle scattering a first polarized wavelength of the light when the nanoparticle is in a first position of rotational motion, the second axis of the nanoparticle scattering a second polarized wavelength of the light when the nanoparticle is in a second position of rotational motion;

providing an iris which passes the first and second polarized wavelengths of scattered light and blocks unscattered light;

providing a polarizing filter which is aligned only to the first and second polarized wavelengths of the light wherein the polarizing filter blocks light not aligned with the filter;

processing the first and second polarized wavelengths of light onto first and second channels, respectively; and

detecting alternating first and second polarized wavelengths indicating motion of the nanoparticle and the molecular structure.

6. The following is an examiner's statement of reasons for allowance:

The claims are drawn to detecting the rotational motion of a molecular motor having a rotating arm. It is possible to detect rotation by observing a rod shaped nanoparticle that is attached to the rotating arm. In the instant case, the prior art does not teach or suggest a method wherein a rod shaped nanoparticle is attached to the rotating arm of the molecular motor by a bridge formed in the presence of a DNA detection strand when hybridized to target DNA strand. Additionally, the declaration filed on October 19, 2010 provides evidence that the fraction of rotating molecules observed when a nanorod was bound to a molecule instead of a nanosphere was found to be 5 to 30 fold higher than reported previously with other methods, including the methods proposed by Yasuda et al (Nature 2001 Vol 410 pages 898-904) (see para 12 of the dec). Further, the declaration filed on November 18, 2010 provides evidence that it is difficult to observe rotation of a circular object at any scale when viewed along the axis of rotation unless the rotation of the object is eccentric to the axis of rotation and/or the rotating object has an asymmetric shape (see para 7 of the dec). For these reasons the claimed invention is allowable.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA SHAW whose telephone number is (571)272-8668. The examiner can normally be reached on Mon-Fri 9:00 TO 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Nguyen can be reached on (571) 272-0731. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Amanda Shaw/
Examiner 1634